Supplement to "The Wireless & Electrical Trader," May 6, 1944

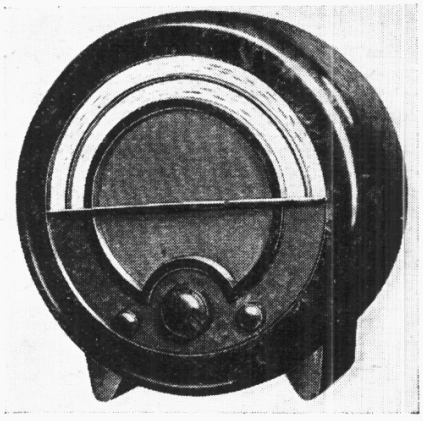
"TRADER" SERVICE SHEET

671

EKCO AC76

REFLEX AC SUPERHET

REVISED ISSUE OF SERVICE SHEET No. 108



The appearance of the Ekco AC76 in the walnut finish.

REFLEX AF amplification is performed by the IF amplifying valve, which also forms part of a special noise suppression circuit, in the Ekco AC76.

The receiver is a 4-valve (plus rectifier) 2-band superhet, designed to operate from AC mains of 200-250 V, 40-80 c/s. It is housed in a plastic cabinet whose finish is either walnut or black and chromium. There is provision for the connection of a gramophone pick-up and a low-impedance external speaker.

Release date and original prices: 1935; *walnut finish,* £11 11*s.*; *black and chromium,* £12 1*s.* 6*d.*

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** and switch **S2** (MW), or via switch **S1** and MW suppression choke **L1** (LW), to tappings on primary coils of inductively coupled band-pass filter. Primary coils **L2, L3** are tuned by **C22;** secondaries **L4, L5** are tuned by **C25.** Coupling by mutual inductance of primary and secondary windings. Image suppression adjustment by **C24** on MW. On LW, **S4** opens, and the suppressor is out of circuit.

First valve **(V1, Mullard metallised FC4)** is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L6** (MW) and **L7** (LW) are tuned by **C27.** Parallel trimming by **C28** (MW). Tracking by specially shaped vanes of **C27,** with series tracking condensers **C4, C29** on LW. Reaction coupling from anode by coils **L8, L9.**

Second valve **(V2, Mazda metallised AC/VP1)** is a variable-mu RF pentode, which performs three functions : first as an intermediate frequency amplifier, then by reflex action as audio frequency amplifier, and it also forms part of the noise suppressor circuit, which is described later.

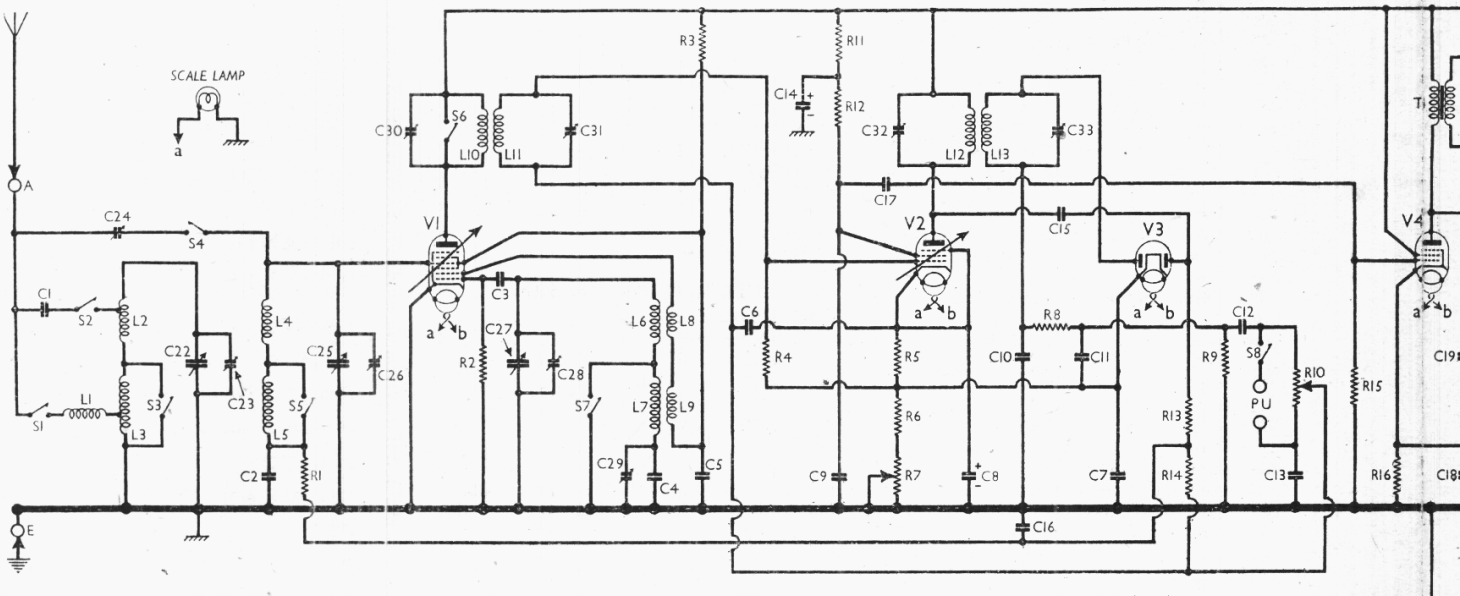
As an IF amplifier, it is coupled by tuned-primary, tuned-secondary transformer couplings **C30, L10, L11, C31** and **C32, L12, L13, C33.**

Intermediate frequency 130 kc/s.

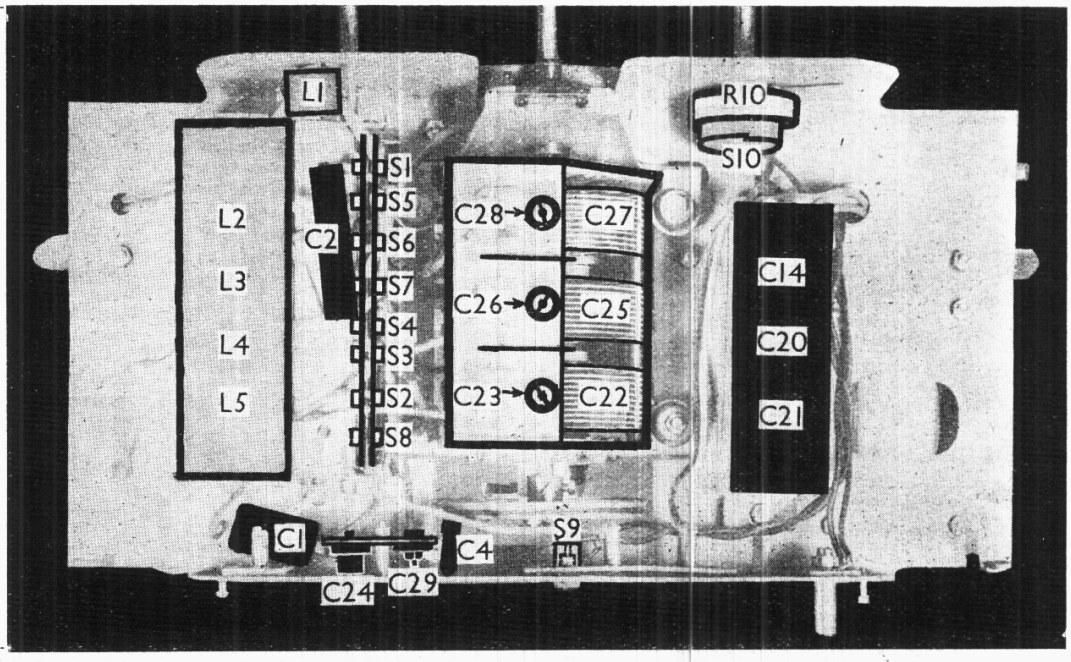
Diode second detector is part of separate double diode valve **(V3, Mullard** metallised **2D4A** or **Mazda V914).** Audio frequency component in rectified output is developed across load resistor **R9** and passed via AF coupling condenser **C12,** manual volume control **R10** and **L11** to control grid of **V2,** whose cathode, control grid and screen grid then operate as a triode AF amplifier. IF filtering by **C10, R8** and **C11.** Condenser **C13,** in series with **R10,** compensates for the normal loss of bass at low volume levels.

Provision for connection of gramophone pick-up across volume control **R10** via switch **S8.** Switch **S6** short-circuits primary of first IF transformer on gramophone, and thus mutes the radio section of the receiver.

Resistance-capacity coupling by **R12, C17** and **R15** between **V2** SG and pentode output valve **(V4, Mazda AC2/Pen). R11, C14** provide AF decoupling for **V2,** SG, and **C9** operates as an RF by-pass, having a negligible effect at audio fre-



Circuit diagram of the Ekco AC76 superhet. **V2,** in addition to acting as an IF amplifier in the normal manner, amplifies as an audio frequency amplifier, signals from the diode circuit being fed back to it via **R10,** when the SG functions as a triode anode. It also forms the major part of a noise suppressor circuit, signal diode bias being obtained from **R6, R7. S6** closes on gram to mute radio signals.



Under-chassis view. All the switches are identified here. The image suppressor **C24** and the oscillator tracker **C29** are mounted on the rear member in a single assembly. **L2-L5** are mounted in another assembly with the waveband switch unit.

quencies. As the cathode operates at audio frequencies, it is by-passed by an electrolytic condenser **C8.**

Fixed tone correction by **C19** in **V4** anode circuit. Provision for connection of low impedance external speaker across secondary of output transformer **T1.** Switch **S9** permits internal speaker to be muted.

Second diode of **V3,** fed from **V2** anode via **C15,** provides DC potentials which are developed across load resistors **R13, R14** and **R4,** from which the low potential end of the load is returned to **V3** cathode. The potential across **R14, R4** is applied via a decoupling circuit to the control grid circuit of **V1** pentode, and that across **R4** to **V2** control grid, giving automatic volume control.

HT current is supplied by IHC full-wave rectifying valve **(V5, Mazda UU3** or **Mullard IW3).** Smoothing by speaker field **L16** and dry electrolytic condensers **C20, C21.**

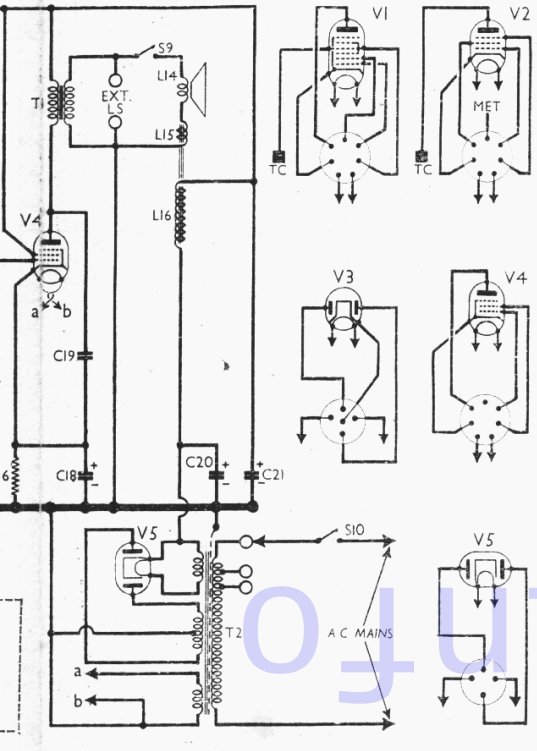
The Noise Suppressor

R7 is the noise suppressor control, and consists of a variable resistor whose control knob is calibrated for "Strong," "Medium" and "All Stations." In the "Strong" position (maximum resistance) the cathode current of **V2** causes a drop of 5 V to be developed across it, while a smaller voltage is developed across the limiting resistor **R6** and **V2** fixed GB resistor **R5.**

As **V3** cathode is returned to the positive end of **R6, R7,** and the signal diode load **R9** is returned to the negative end (chassis), a negative bias of about 5 V will be applied to the signal diode, so that until the signal at this point exceeds 5 V, rectification does not occur, and the set is silent. The signal and the noise are suppressed together, and the makers explain that the purpose of the suppressor is to permit silent tuning, only signals strong enough to overwhelm local noise being heard as the tuning control is turned.

If the noise suppressor control is turned to "Medium," weaker stations are receivable, but this position is intended for less noisy districts. In the "All Stations" position, the suppression effect is very small, and all stations within the range of the receiver are heard. If strong distant transmissions are received with the suppressor control advanced, they are liable to disappear altogether on a fade when their strength at the detector falls to the value of the bias voltage from the suppressor.

As the AVC diode load circuit is returned to **V3** cathode, there is no delay on this circuit, and the AVC diode begins to function as soon as a signal arrives. When the suppressor is advanced, the gain of the receiver is already reduced by AVC action before the signal is large enough to exceed the suppressor voltage, so that the suppression effect that the signal must overcome is greater at the aerial than is implied by the bias voltage at the detector.



COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial MW coupling ...	0·0008
C2	V1 pent. CG decoupling	0·1
C3	V1 osc. CG condenser ...	0·001
C4	Osc. LW tracker ...	0.0007
C5	V1 HT decoupling ...	0·1
C6	V2 CG decoupling ...	0·0008
C7	V3 cathode by-pass ...	0·1
C8*	V2 cathode by-pass ...	25·0
C9	V2 SG RF by-pass ...	0·0008
C10 } C11 }	IF by-pass condensers ...	0·0003 0·0003
C12	AF coupling to V2 ...	0·01
C13	Bass compensator ...	0·1
C14*	V2 SG decoupling ...	2·0
C15	Coupling to V3 AVC diode	0·0001
C16	V1 AVC line decoupling	0·1
C17	AF coupling to V4 ...	0·1
C18*	V4 cathode by-pass ...	25·0
C19	Tone corrector	0·004
C20* } C21* }	HT smoothing condensers ...	8·0 8·0
C22†	Band-pass pri. tuning ...	—
C23‡	B-P pri. MW trimmer ...	—
C24‡	Image suppressor ...	—
C25†	Band-pass sec. tuning ...	—
C26‡	B-P sec. MW trimmer ...	—
C27†	Oscillator circuit tuning	—
C28‡	Osc. circ. MW trimmer...	—
C29‡	Osc. circ. LW tracker ...	—
C30‡	1st IF trans. pri. tuning	—
C31‡	1st IF trans. sec. tuning	—
C32‡	2nd IF trans. pri. tuning	—
C33‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	V1 pent. CG decoupling	500,000
R2	V1 osc. CG resistor ...	50,000
R3	V1 HT feed resistor ...	30,000
R4	Part of V3 AVC diode load	250,000
R5	V2 fixed GB resistor ...	300
R6	Noise supp. limiter ...	75
R7	Noise suppressor control	2,000
R8	IF stopper	50,000
R9	V3 signal diode load ...	250,000
R10	Manual volume control...	250,000
R11	V2 SG decoupling ...	15,000
R12	V2 SG AF load... ...	50,000
R13	Parts of V3 AVC diode	250,000
R14	load	500,000
R15	V4 CG resistor	250,000
R16	V4 GB resistor	140

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial MW suppressor ...	46·0
L2	Band-pass primary coils...	2·2
L3		29·0
L4	Band-pass secondary coils	2·2
L5		29·0
L6	Oscillator grid tuning coils	4·6
L7		9·6
L8	Oscillator anode reaction	
L9	coils, total	5·0
L10	1st IF trans. Pri. ...	75·0
L11	Sec. ...	75·0
L12	2nd IF trans. Pri. ...	75·0
L13	Sec. ...	75·0
L14	Speaker speech coil ...	1·3
L15	Hum neutralising coil ...	0·1
L16	Speaker field coil ...	2,000·0
T1	Output trans. Pri. ...	600·0
	Sec. ...	0·15
T2	Mains trans. Pri. total ...	37·0
	Heater sec. ...	0·1
	Rect. heat, sec.	0·15
	HT sec., total...	560·0
S1–S5	Waveband switches ...	—
S7		
S6	Radio muting switch ...	—
S8	Gram pick-up switch ...	—
S9	Internal speaker switch ...	—
S10	Mains switch, ganged R10	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, using the 220-230 V tapping. The volume control was at maximum, as was the sensitivity control, and the receiver was tuned to the lowest wavelength on the medium band, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC4	275	2·8	80	4·3
	Oscillator			
	75	2·2		
V2 AC/VP1	275	5·7	160	1·5
V3 V914	—	—	—	—
V4AC/2Pen	250	37·0	275	7·4
V5 UU3	345†	—	—	—

† Each anode, AC

DISMANTLING THE SET

Removing Chassis.—After removing the back cover (six screws, with washers), remove the three control knobs (recessed grub screws) from the front of the cabinet, and the noise suppressor control knob (recessed grub screw accessible from the inside of the cabinet);

remove the two screws (with washers) holding the rear member of the chassis to the rear of the cabinet, and the two screws (with two washers each) holding the top of the chassis to the front of the cabinet.

The chassis may now be withdrawn as a single assembly, complete with the speaker.

When replacing, take care that the heater wiring of **V1, V2** and **V3** is not nipped, and that the components on the front of the chassis do not foul the cursor carrier arm.

Turn the noise suppressor control spindle fully clockwise, and fit the control knob so that the lettering "Strong" is uppermost.

Removing Speaker.—After removing the chassis from the cabinet, unsolder from the connecting panel on the speaker the four leads connecting it to chassis;

remove the four screws (with lock-washers) holding the speaker to the chassis.

When replacing, the connecting panel should be on the left, when viewed from the rear, and the leads should be connected as follows, numbering the tags from top to bottom: 1, red; 2, blue; 3, blue; 4, no external connection; 5, red.

GENERAL NOTES

Switches.—S1-S8 are the waveband, pick-up and radio muting switches, in a single unit, seen in our under-chassis view, in which the individual switches are indicated. The table below gives the switch positions for the various control settings, a dash indicating open, and **C**, closed.

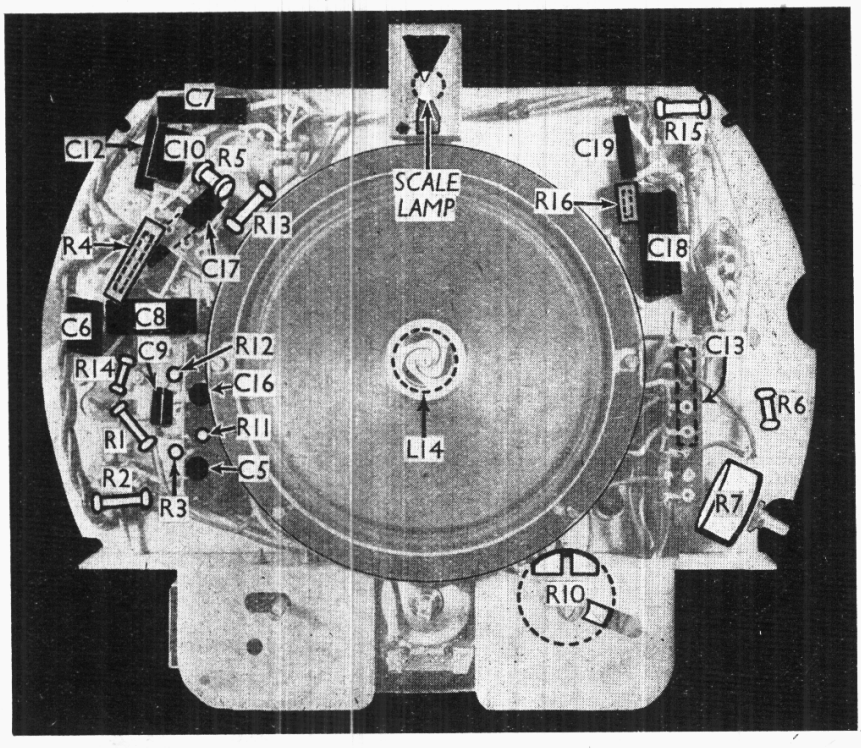
S9 is the internal speaker switch, operated by a small moulded knob at the rear of the chassis which, when unscrewed, disconnects the internal speaker.

S10 is the QMB mains switch, ganged with the volume control **R10.**

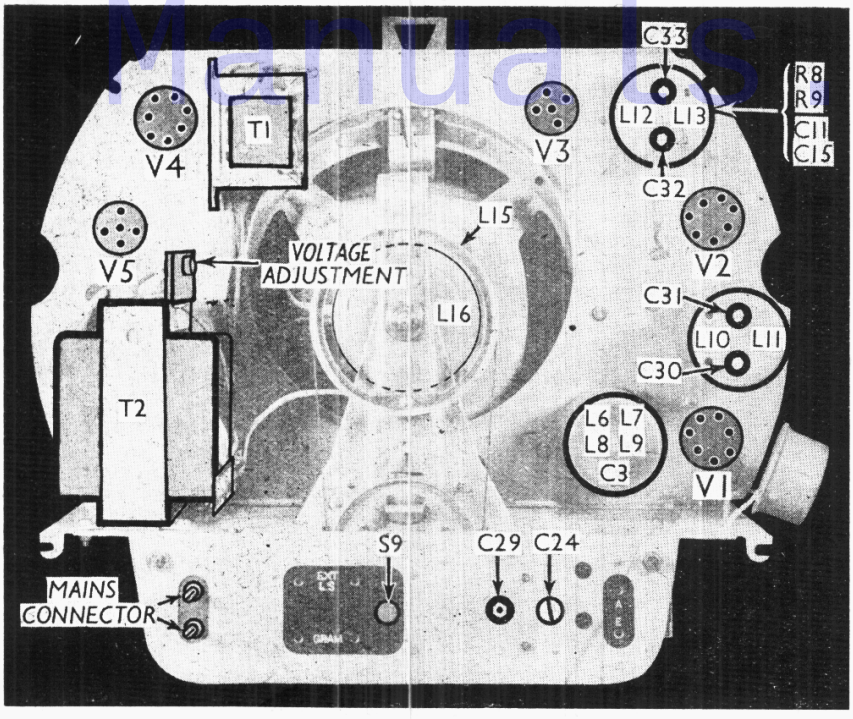
Switch	MW	LW	Gram
S1	—	C	—
S2	C	—	—
S3	C	—	—
S4	C	—	—
S5	C	—	—
S6	—	—	C
S7	C	—	—
S8	—	—	C

Coils.—The choke **L1** and the coils **L2-L5** are beneath the chassis, the latter being in a screened unit at the side of which is mounted the switch unit. The coils **L6-L9,** and the IF transformers **L10, L11** and **L12, L13,** are in three screened units seen in our rear chassis view. Note that the **L6-L9** unit contains also **C3,** while the second IF transformer unit contains **R8, R9, C11, C15,** in addition to the trimmers **C32, C33.**

Scale Lamp.—This is a Mazda MES



Front view of the chassis. Most of the small components are seen here distributed round the speaker, which is mounted on the chassis. **C13** is hidden by the terminal strip on the right.



Rear view of the chassis. **R8**, **R9**, **C11** and **C15** are contained in the **L12**, **L13** unit, while **C3** is inside the **L6-L9** unit. The scale cursor carrier arm is pivoted at the rear of the speaker and follows its contour. The cursor, which carries the scale lamp, travels round the speaker rim.

type, rated at 6.2 V, 0.3 A. It is fitted behind the travelling scale cursor.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2.5-3Ω) external speaker. The screw-type switch **S9** permits the internal speaker to be muted if desired.

Condensers C14, C20, C21.—These are three dry electrolytics, in a single unit, seen in our under-chassis view. The unit has a common negative (black) lead. The yellow lead is the positive of **C14** (2 μF), the blue lead is the positive of **C20** (8 μF) and the red lead is the positive of **C21** (8 μF).

Condenser C13.—This is behind the terminal strip to the right of the loudspeaker, and is shown dotted in our front chassis view.

Replacing Drive Cable.—The new cord must be 33 in. long, with a knot ¼ in. from each end to prevent it slipping from the small metal "Y" clip supplied with each length. After clamping ends of the cord into arms of the "Y" clip with pliers, the loop thus formed should be passed from inside of lower drum through small slot in its rim.

Rotate gang condenser to bring slot uppermost, and pass each side of the loop round lower drum for ¾ of a complete turn before leaving the edge at a tangent to the upper drum. Turn latter so that the slot in its rim is uppermost, and pass loop round the groove and finally through the slot towards centre of the drum. Loop the cord over the brass centre bush, and then hook one end of tensioning spring through hole in the "Y" piece, and the other end over projection provided on lower drum.

Before finally clamping cord by means of the ¾ in. brass washer fixed to indicator arm, rotate latter to its limit in a clockwise direction viewed from back of chassis to bring gang condenser to its maximum capacity.

Replacing Scale.—Remove chassis from cabinet, and remove the two semi-circular metal clamping brackets round periphery of scale inside cabinet (2 nuts at ends, and 5 screws). Scale can now be removed, with moulded semi-circular centre bar at front. Before fitting new scale, refix this bar to it (2 bolts and 3 screws). This will assist in spacing wavelength and station markings accurately in scale aperture.

CIRCUIT ALIGNMENT

IF Stages.—Remove chassis from cabinet. Switch set to LW and tune to about 1,000 m. Connect 0-10 milliammeter across **R7**, which should be at maximum (clockwise). Connect signal generator to **A** and **E** sockets, feed in a 130 kc/s (2,307.7 m) signal, and adjust **C30, C32** and **C31** in that order, for minimum reading on milliammeter. Now adjust **C33** for maximum milliammeter reading. Keep input signal as low as possible during alignment.

RF and Oscillator Stages: MW.—Switch set to MW, turn gang to minimum capacity, feed in a 194.5 m (1,540 kc/s) signal, and adjust **C28** for minimum reading on the milliammeter.

Feed in a 250 m (1,200 kc/s) signal, and tune receiver for minimum reading on the meter. Now adjust **C23** and **C26** for a second minimum reading, reducing input signal if necessary. Check calibration on MW at several points on the scale.

LW.—Switch set to LW, and check calibration at 1,600 m (187.5 kc/s). If not accurate, adjust **C29** (at rear of chassis) for maximum output (minimum meter reading) while rocking the gang for optimum results.

Image Suppressor.—If image interference is experienced, it may be minimised by tuning the receiver to the frequency at which it is found and adjusting **C24** for minimum interference, using the speaker as an indicator.

Do not screw up the trimmer further than is necessary, as otherwise the local transmitter image will take the place of the whistle, and other whistles will occur on the MW band.

"Trader" Service Sheet Supplementary Index

Nos. 654-671

This interim index covers all the Service Sheets issued since the last complete index was published, in "The Trader", dated January 1, 1944.

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† *Revised issue : original number in parenthesis.*

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